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EXAMINER

PIGGUSH, AARON C

ART UNIT PAPER NUMBER

2838

DATE MAILED: 11/17/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/604,800

Applicant(s)

SALASOO ET AL. 

Examiner

Aaron Piggush

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 19 September 2005.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 5-9, 27, 29 and 30 is/are allowed.
- 6) ☒ Claim(s) 1-4, 18-21, 24-26, 31 and 32 is/are rejected.
- 7) ☒ Claim(s) 33-39 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 24 September 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1 and 2 are rejected under 35 U.S.C. 102(b) as being anticipated by Ukita (US 5,905,360).

With respect to claim 1, Ukita discloses a method for equalizing a storage parameter for a vehicle energy storage system having one or more energy storage banks associated therewith, the method comprising:

identifying a quiescent period of operation for the vehicle (col 4 ln 2-8);

determining whether the value of a defined storage quantity for a first energy storage bank differs from the value of said defined storage quantity for a second energy storage bank by a threshold amount (col 9 ln 46-53); and

during said quiescent period of operation, discharging one of said first and second energy storage banks and charging the other of said first and second energy storage banks (col 4 ln 2-14 and Fig. 5 and 6);

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wherein said one of said first and second energy storage banks corresponds to the bank having the value of said defined storage quantity exceeding the value of said defined storage quantity of said other of said first and second energy storage banks (col 9 ln 46-51 and Fig. 5 and 6).

With respect to claim 2, Ukita discloses the method of claim 1, wherein said defined storage quantity comprises at least one of: stored energy, relative stored energy, stored energy minus rating, stored charge, relative stored charge, and stored charge minus rating (col 9 ln 46-47).

3. Claims 3, 18, and 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Hoffman, Jr. (US 5,869,950).

With respect to claim 3, Hoffman, Jr. discloses a method for equalizing a storage parameter for a vehicle energy storage system having one or more energy storage banks associated therewith, the method comprising (col 2 ln 5-8):

identifying an active period of operation for the vehicle (col 2 ln 9-10);

determining whether the value of a defined storage quantity for a first energy storage bank differs from the value of said defined storage quantity for a second energy storage bank by a threshold amount (col 2 ln 13-17 and 18-24, i.e. Hoffman, Jr. describes a module with a high voltage and one with a low voltage which therefore implies a threshold between the two);

during a motoring operation of the vehicle (col 2 ln 9-11), applying discharging energy from said one of said first and second energy storage banks to said motoring operation if the value of said defined storage quantity for said one of said first second energy storage banks

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differs from the value of said defined storage quantity for said other of said first and second energy storage banks by said threshold amount (col 2 ln 24-30 and col 6 ln 65-67 to col 7 ln 1-4).

With respect to claim 18, Hoffman, Jr. discloses a method for generating an energy storage control parameter for a vehicle energy storage system, the method comprising:

receiving energy storage electrical property information (col 16 ln 58-65); and
estimating, from said energy storage electrical property information, a storage bank temperature (col 16 ln 63).

With respect to claim 19, Hoffman, Jr. discloses the method of claim 18, wherein said energy storage electrical property information includes at least one of: internal resistance, change in internal resistance, equivalent series resistance, terminal voltage, and open circuit recovery time constant (col 16 ln 62-65).

4. Claims 24-26 are rejected under 35 U.S.C. 102(b) as being anticipated by Dunn (US 6,239,579).

With respect to claim 24, Dunn discloses a method for controlling the operating range of one or more energy storage banks in a vehicle energy storage system, the method comprising:

determining a point at which the energy storage bank has reached a threshold value with respect to an end of life (EOL) condition (col 3 ln 15-16 and abstract ln 7-13); and

responsive to said threshold value, reducing at least one of an energy storage bank operating parameter and an energy storage bank operating range (col 5 ln 56-60 and col 3 ln 55-60).

With respect to claim 25, Dunn discloses the method of claim 24, wherein the energy storage bank further comprises a storage battery and said at least one energy storage bank

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operating parameter and said at least one energy storage bank operating range further comprises at least one of: a charging terminal voltage, a maximum state of charge (SOC), a maximum current flow, a maximum power flow, a maximum stored energy, an operating range between minimum and maximum SOC, an operating range between minimum and maximum stored energy, an operating range between minimum and maximum stored charge, an operating range between minimum and maximum terminal voltage (col 5 ln 56-60 and col 6 ln 61-66).

With respect to claim 26, Dunn discloses the method of claim 25, wherein said threshold value with respect to an end of life (EOL) condition is based upon at least one of: a total number of ampere-hours charged or discharged, a total number of kilowatt-hours charged or discharged, a total number of operating hours in charge or discharge mode, an elapsed time in operation, a number of vehicle missions completed, a total vehicle distance traveled, a vehicle total fuel consumed or energy supplied from an engine, an increase in calculated battery internal resistance or impedance, or reduction of charge or energy used to equalize a state of charge (SOC) calculation of said battery (col 4 ln 20-28).

5. Claim 31 is rejected under 35 U.S.C. 102(b) as being anticipated by Clegg (US 5,394,089).

With respect to claim 31, Clegg discloses a method for characterizing and projecting remaining cycle life for vehicle storage battery, the method comprising:

- performing a series of initial battery characterization tests (col 1 ln 20-26);
- performing a series of periodic battery tests during the operating life of the vehicle storage battery (col 6 ln 10-12);

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comparing the results of said periodic battery tests with said initial battery characterization tests (col 6 ln 9-15); and

projecting a remaining cycle life for the vehicle storage battery (col 6 ln 30-37 and abstract ln 7-9).

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Hoffman, Jr. (US 5,869,950) in view of Kumar (US 6,615,118).

With respect to claim 4, Hoffman, Jr. discloses the method of claim 3 as noted above in the rejection under 35 U.S.C. 102(b), further comprising:

during a dynamic braking operation of the vehicle, applying charging energy generated by dynamic braking operation (col 3 ln 48-49). However, Hoffman does not expressly disclose applying the energy to said other of said first and second energy storage banks if the value of said defined storage quantity for said one of said first and second energy storage banks differs from the value of said defined storage quantity for said other of said first and second energy storage banks by said threshold amount.

Kumar discloses an energy capture and storage system (108 and 204 in Fig. 5) that selectively receives electrical power generated during dynamic braking and stores it (col 6 ln 5-7) and additionally states that excess power from one of the locomotives, which is working in a

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consist with another locomotive, can be transferred and stored in the other energy capture and storage system (col 6 ln 12-15), in order to prevent wasting the energy generated from dynamic breaking (col 3 ln 3-4) and therefore, the user can save on transportation costs.

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the method of storing dynamic breaking energy of Hoffman, Jr. to include the application of the energy to one of the storage banks which differs from the other storage bank by a threshold amount, so that the energy generated from dynamic breaking would not be wasted (col 3 ln 3-4) and therefore, the user can save on transportation costs.

It is understood that the other locomotive would contain its own energy capture and storage system, as to match the same description of the first locomotive, and furthermore, it is understood that because one energy storage system is at a full capacity and the other can still receive some of the energy from dynamic breaking, there is a difference or threshold between the voltage levels of the two storage systems.

8. Claims 20 and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hoffman, Jr. (US 5,869,950) in view of King (US 5,659,240).

With respect to claim 20, Hoffman, Jr. discloses the method of claim 18 as noted above in the rejection under 35 U.S.C. 102(b), however, does not expressly disclose wherein said estimating a storage bank temperature further comprises receiving one or more actual temperature measurements within the vehicle energy storage system.

King discloses sampled measures of battery voltage and battery temperature (col 1 ln 35-38 and 30 in Fig. 5), so that the system can compensate for the battery's altered capacity (col 1 ln

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42-44) which in turn would prevent reduction of battery life, additional watering maintenance, and wasting energy due to overcharging (col 1 ln 20-23).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the method for generating an energy storage control parameter for a vehicle energy storage system to include receiving one or more actual temperature measurements within the vehicle energy storage system, as was the method of King, so that compensation could be made for the battery's altered capacity in order to prevent reduction of battery life, additional watering maintenance, and wasting energy due to overcharging.

With respect to claim 21, Hoffman, Jr. discloses the method of claim 18 as noted above in the rejection under 35 U.S.C. 102(b), however, does not expressly disclose wherein said estimating a storage bank temperature further comprises utilizing at least one of: a battery cell thermal resistance value, a battery cell heat capacity value, a battery module thermal resistance value, a battery module heat capacity value, a battery assembly thermal resistance value, and a battery assembly heat capacity value.

King discloses a battery pack including a plurality of temperature sensors, each coupled to a respective cell, or module (col 2 ln 45-49 and 30 in Fig. 5), so that the temperature or heat capacity of the battery can be measured and the system can compensate for the battery's altered capacity (col 1 ln 42-44) which in turn would prevent reduction of battery life, additional watering maintenance, and wasting energy due to overcharging (col 1 ln 20-23).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the method for generating an energy storage control parameter for a vehicle energy storage system to include the utilization of a battery cell thermal resistance value, a

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battery cell heat capacity value, a battery module thermal resistance value, a battery module heat capacity value, a battery assembly thermal resistance value, and a battery assembly heat capacity value, as was the method of King, so that compensation could be made for the battery's altered capacity in order to prevent reduction of battery life, additional watering maintenance, and wasting energy due to overcharging.

9. Claim 32 is rejected under 35 U.S.C. 103(a) as being unpatentable over Clegg (US 5,394,089) in view of Ukita (US 5,905,360).

With respect to claim 32, Clegg discloses the method of claim 31 as noted above under 35 U.S.C. 102(b), and furthermore discloses wherein said series of initial battery characterization tests further comprises: a first test, said first test comprising an initial commissioning charge and capacity test (col 1 ln 22-23). However, Clegg does not expressly disclose:

a second test, said second test comprising a full recharge and partial discharge test; and
a third test, said third test comprising a partial charge and partial discharge test.

Ukita discloses a procedure comprising a full recharge and a partial discharge as can be seen in Fig. 5 (col 9 ln 13-20), and a procedure comprising a partial charge and a partial discharge as can be seen in Fig. 5 and Fig. 8 (col 9 ln 46-54), so that an unequal electrode status or unequal electromotive force and excessive charge or discharge, all of which shorten battery life, can be prevented (col 1 ln 30-32 and col 3 ln 49-53).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to modify the characterization tests of Clegg to include a second test comprising a full recharge and partial discharge test and a third test comprising a partial charge and partial

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discharge test, so that an unequal electrode status or unequal electromotive force and excessive charge or discharge, all of which shorten battery life, can be prevented.

Allowable Subject Matter

10. Claims 5-9, 27, 29, and 30 are allowed.

11. The following is a statement of reasons for the indication of allowable subject matter:

Claims 5, 6, and 8 recite, inter alia, a method for resetting a state of charge (SOC) calculation for a designated energy storage bank of an energy storage system of a vehicle, the method comprising: maintaining the designated energy storage bank at a predetermined high terminal voltage for a specified period of time.

Claim 7 recites, inter alia, the method of claim 6 wherein: said one or more available energy storage banks are a preferred discharging sink for the designated energy storage bank over said vehicle motoring operation and said resistive grid; and said vehicle motoring operation is a preferred discharging sink for the designated energy storage bank over said resistive grid.

Claim 9 recites, inter alia, the method of claim 8, wherein: said one or more available energy storage banks are a preferred charging source for the designated energy storage bank over said vehicle dynamic braking operation and said combustion engine.

Claim 27 recites, inter alia, a method for controlling one or more energy storage banks in a vehicle energy storage system, the method comprising: wherein a flow of said power is prioritized in accordance with the one or more energy storage banks having the highest remaining life cycle.

Claim 29 recites, inter alia, the method of claim 27, further comprising: determining an initial participation factor for each of the energy storage banks, said initial participation factor

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representing the relative contribution of a given storage bank with respect to the remaining storage banks.

Claim 30 recites, inter alia, the method of claim 29, further comprising: based on said determined remaining life cycle for each of the energy storage banks, generating an adjusted participation factor for one or more of the energy storage banks; wherein an initial participation factor for a first storage bank having a greater remaining life cycle is increased with respect to an initial participation factor for a second storage bank having a lesser remaining life cycle.

The art of record does not disclose the above limitations, nor would it be obvious to modify it in such a manner.

12. Claims 33-39 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 33 recites, inter alia, the method of claim 32, further comprising adding water to the vehicle storage batter following completion of said first test, if the water level thereof is below a minimum defined level.

Claim 34 recites, inter alia, the method of claim 32, wherein during the performance of said third test, if an output voltage of the storage battery drop s to a first cut-off value, then said third test is aborted and said first test is repeated.

Claim 35 recites, inter alia, the method of claim 34, wherein during the performance of said third test, if an output voltage of the storage battery drops to a second cut-off value, then said third test is aborted and said first test is repeated.

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Claim 36 recites, inter alia, the method of claim 35, wherein said first cut-off value is related to a determined level of discharge current spiking associated with said third test, and said second cut-off value is related to a final C rate discharge portion associated with said third test.

Claims 37-39 recite, inter alia, the method of claim 36, further comprising: repeating said third test for at least a first number, N1 of iterations, wherein N1 represents a specified number of cycles between an initial commissioning charge and a scheduled maintenance of the storage battery; and following at least N1 iterations of said third test, continuing subsequent iterations of said third test until a battery output quantity falls below a corresponding rated quantity of the storage battery, at which time a second number, N2 of total iterations is recorded.

The art of record does not disclose the above limitations, nor would it be obvious to modify it in such a manner.

Response to Arguments

13. Applicant's arguments filed September 19, 2005 with respect to claims 1, 3, 18, 24, and 31 have been fully considered but they are not persuasive.

With respect to claim 1, applicant argues that Ukita (US 5,905,360) fails to teach a method for determining whether the value of a defined storage quantity for a first energy storage bank differs from the value of the defined storage quantity for a second energy storage bank by a threshold amount.

The examiner respectfully disagrees for the following reasons: Ukita teaches considering a significant difference in state of charge between the two battery blocks (col 9 ln 46-53). A significant difference is a threshold amount, especially when an action is started or stopped in response to that significant difference, as was the case with the method of Ukita. Furthermore,

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although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

With respect to claim 3, applicant argues that Hoffman, Jr. (US 5,869,950) fails to teach a method for determining whether the value of a defined storage quantity for a first energy storage bank differs from the value of the defined storage quantity for a second energy storage bank by a threshold amount.

The examiner respectfully disagrees for the following reasons: Hoffman teaches sensing the voltages of the modules, a storage quantity (col 2 ln 13-17), and identifying a high and low module based on the sensed voltages (col 2 ln 18-24). That difference between the modules, which allows them to be ranked and charged/discharged, is a threshold.

With respect to claim 18, applicant argues that Hoffman, Jr. (US 5,869,950) fails to teach a method for estimating, from the energy storage electrical property information, a storage bank temperature.

The examiner respectfully disagrees for the following reasons: Hoffman teaches estimating a storage bank temperature from energy storage electrical property information (col 16 ln 58-65). In this case, the energy storage electrical property information that is used to estimate a storage bank temperature is a module temperature. Furthermore, any value (e.g. temperature) calculated from information, which is gathered from a device, is an estimate since there are no absolutes when measuring quantities, such as temperature, as is well known to those skilled in the art.

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With respect to claim 24, applicant argues that Dunn (US 6,239,579) fails to teach a method for determining a point at which the energy storage bank has reached a threshold value with respect to an end of life condition.

The examiner respectfully disagrees for the following reasons: Dunn teaches a method for determining a point at which the energy storage bank has reached a threshold value with respect to an end of life condition (col 3 ln 15-16 and abstract ln 7-13). Furthermore, this method is described in the abstract of Dunn wherein the module can be recharged when the useful capacity falls below a predefined threshold, or alternatively, an alarm can be triggered to alert the user that the module is due for replacement (abstract ln 7-13).

With respect to claim 31, applicant argues that Clegg (US 5,394,089) fails to teach a method for projecting a remaining cycle life for the vehicle storage battery.

The examiner respectfully disagrees for the following reasons: Clegg teaches evaluating, storing, and updating the recharging efficiency, and that information is used so that the ageing of the battery can be monitored (abstract ln 7-9). The ageing of a battery is a direct indication of its remaining cycle life. Furthermore, Clegg claims the computation of a measure of remaining battery life in claim 1 of his patent (col 7 ln 1-2).

Conclusion

14. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after

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the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Aaron Piggush whose telephone number is 571-272-5978. The examiner can normally be reached on Monday-Friday 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Karl Easthom can be reached on 571-272-1989. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

AP


KARL D. EASTHOM
PRIMARY EXAMINER